PHYSICS EXPLORATORIUM SCRIPT DRAFT #2

*Italics – Rebecca*

**Bold - students**

*Hi guys! I’m Rebecca! Before we begin I have a question for you all! Since I know you are all such great students, when you get good grades, where do your parents hang your tests?*

**THE FRIDGE**

*And what do your parents hang them with?*

**MAGNETS**

*Do any of you know how this works?*

**(Silence)/Magnetism**

*That’s okay! Because I am here to teach you!/Very good! And I am here to teach you all about it! Along with me are my two assistants. I’d like you meet Amanda and Andrea. They are both experts on magnetism and are here to answer any and all of your questions!*

*So this phenomenon that you see every time your parents hang something on the fridge is known as magnetism! Magnetism involves magnets. A magnet is any object that produces its own magnetic field that interacts with other magnetic fields. Magnets have a North and South Pole. Have you guys ever heard the saying opposites attract? Well that’s the same for magnet poles. Opposite poles attract each other and like poles repels each other. (Show demonstration of magnetics and identify poles) Do any of you know what a magnetic field is?*

**No.**

*That’s okay! Because I am here to show you through four demonstrations.*

**YEAH!**

DEMONSTRATION #1

(Iron Fillings)

*A magnetic field is an invisible force that surrounds a magnetic. Although it may seem extremely mysterious, it is really quite simple. For example, when a magnet is held to this whiteboard, the whiteboard is within the magnetic field of the magnet and therefore there is an attracting force. This attracting force is what causes the magnet to stick to the board. If the magnet is held too far away from the board, there will be no attracting force. Not all materials are attracted to magnets however. There are a few things to know about magnetic field lines before we begin. Can anyone tell me a few materials that are?*

**(Possible answers: paper clip, metal, iron, ect)/No answer**

*Very good! You guys really know your stuff!/That’s okay! Two examples of materials that are attracted to magnets are metal and iron! You have probably all seen paper clips attracted to magnets. Well this is because paper clips are metallic. Does anyone have any questions so far?*

**Answer questions if asked.**

*Are you all sure you have no more questions? I don’t want to move on before everyone understands everything!*

**Answer questions if asked.**

*(Hold up container)*

*Within this container are iron fillings. Iron fillings are very small pieces of iron that look almost like a powder.*

*(Pour powder onto paper to show example)*

*As I just mentioned, iron is a material that is attracted to magnets! So when this u-shaped magnet is place under the paper the iron filings will form into the structure of the magnetic field lines. As the magnet gets closer and closer the field becomes stronger and stronger creating this pattern. This also shows the North and South Poles. As I said before the lines start at the magnets North Pole and end at the South Pole.*

*(Use different magnets with different magnetic field strengths to attract iron)*

*So now everyone, how come when I hold the magnet here (far away from iron) the fillings DO NOT attract the magnet and how come when I hold the magnet here (close to the iron) the filling DO attract?*

**Call on student to answer.**

*Very good! You guys catch on quick! Are there any questions so far?*

**Answer questions if asked!**

DEMONSTRATION #2

(Flying paperclip)

*Just in case some of you have yet to completely understand the basics of a magnetic field, I will use this next demonstration to emphasize the concept. For this next demo, I will make a paper clip float in mid air!!!!!!!! No I am no magician! Its simply magnetism!!!!!!*

(Set up floating paper clip demonstration and move object through missing space to show there is nothing between the metal and the paper clip)

*Does anyone want to try and explain why this is happening?*

**Call on student to answer and clarify any misconceptions made in explanation.**

Explanation: Magnets exert an invisible force that can act at a distance. The space around the magnet within which a magnetic force has an effect is referred to as the magnetic field. There is an attracting force between the magnets and the paper clip because the paper clip lies within the magnets magnetic field.

*Now, when I hold the paper clip here (far away from magnets) why does it NOT float? And, when I hold the paper clip here (close to magnets) why does it float?*

**Call on student to answer.**

*Very good! I hope both these demonstrations helped you understand what a magnetic field is. But just in case, does anyone have any questions about anything so far in todays lesson?*

**Answer questions if asked.**

*Okay! Then we are going to move onto another part of magnetism.*

DEMONSTRATION #3

(Strange Attractor)

*For the next demonstration I am going back to the opposite poles of a magnet. Lets try and label these poles again! When holding two magnets together the north pole of one magnet always attracts the south pole of the other magnet while both north poles or both south poles will repel the other. Look!*

*(Hold two magnets next to each turning in different ways to identify each pole label)*

ACTIVITY

Push the magnet and see the pattern formed! After observing, vary the location and poles of the magnets to develop other patterns. Even change the starting position of the pendulum and observe the new pattern developed.

*As seen in the demonstration various patterns of motion were created from varying the location and position of the magnets as well as the starting position of the pendulum. These patterns are influence by the collaboration of the force of gravity acting on the free-swinging magnet and the attraction and repulsion each magnet has on the other. Does anyone want to try and make their own pattern?*

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*Italics – Rebecca*

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**THE FRIDGE**

*And what do your parents hang them with?*

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*Do any of you know how this works?*

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*That’s okay! Because I am here to teach you!/Very good! And I am here to teach you all about it! Along with me are my two assistants. I’d like you meet Amanda and Andrea. They are both experts on magnetism and are here to answer any and all of your questions!*

*So this phenomenon that you see every time your parents hang something on the fridge is known as magnetism! Basically, magnetism is a force of attraction or repulsion, which I will explain through four demonstrations. Are you guys ready?*

**YEAH!**

DEMONSTRATION #1

(Iron Fillings)

*All magnets have imaginary lines that create a magnetic field. This field is what can create the mysterious force on other objects. For example, when a magnet is held to this whiteboard, the whiteboard is within the magnetic field of the magnet and therefore there is an attracting force. This attracting force is what causes the magnet to stick to the board. If the magnet is held too far away from the board, there will be no attracting force. Not all materials are attracted to magnets however. Can anyone tell me a few materials that are?*

**(Possible answers: paper clip, metal, iron, ect)/No answer**

*Very good! You guys really know your stuff!/That’s okay! Two examples of materials that are attracted to magnets are metal and iron! You have probably all seen paper clips attracted to magnets. Well this is because paper clips are metallic. Does anyone have any questions so far?*

**Answer questions if asked.**

*Are you all sure you have no more questions? I don’t want to move on before everyone understands everything!*

**Answer questions if asked.**

*(Hold up container)*

*Within this container are iron fillings. Iron fillings are very small pieces of iron that look almost like a powder.*

*(Pour powder onto paper to show example)*

*As I just mentioned, iron is a material that is attracted to magnets! So when these fillings are held within the magnetic field of magnets, there will be an attracting force and the fillings will attach to the magnet. Look!*

*(Use different magnets with different magnetic field strengths to attract iron)*

*So now everyone, how come when I hold the magnet here (far away from iron) the fillings DO NOT attract the magnet and how come when I hold the magnet here (close to the iron) the filling DO attract?*

**Call on student to answer.**

*Very good! You guys catch on quick! Are there any questions so far?*

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*Now, when I hold the paper clip here (far away from magnets) why does it NOT float? And, when I hold the paper clip here (close to magnets) why does it float?*

**Call on student to answer.**

*Very good! I hope both these demonstrations helped you understand what a magnetic field is. But just in case, does anyone have any questions about anything so far in todays lesson?*

**Answer questions if asked.**

*Okay! Then we are going to move onto another part of magnetism.*

DEMONSTRATION #3

(Strange Attractor)

*I know you guys ALL know this next question! What’s the big, big planet that has a north and south pole?*

**Earth**

*That’s right! And where are the North Pole and South Pole?*

**Opposite ends of earth**

*Wow! You guys are too smart! That’s right! Similar to the earth, magnets have north and south poles too!*

*(Hold up bar magnet and label one side north and one side south)*

*Remember that saying opposites attract? Well think about that now! When holding two magnets together the north pole of one magnet always attracts the south pole of the other magnet while both north poles or both south poles will repel the other. Look!*

*(Hold two magnets next to each turning in different ways to identify each pole)*

ACTIVITY

Push the magnet and see the pattern formed! After observing, vary the location and poles of the magnets to develop other patterns. Even change the starting position of the pendulum and observe the new pattern developed.

*As seen in the demonstration various patterns of motion were created from varying the location and position of the magnets as well as the starting position of the pendulum. These patterns are influence by the collaboration of the force of gravity acting on the free-swinging magnet and the attraction and repulsion each magnet has on the other.*

**Let student try one time.**

*Look at that! Good job!*

DEMONSTRATION #4

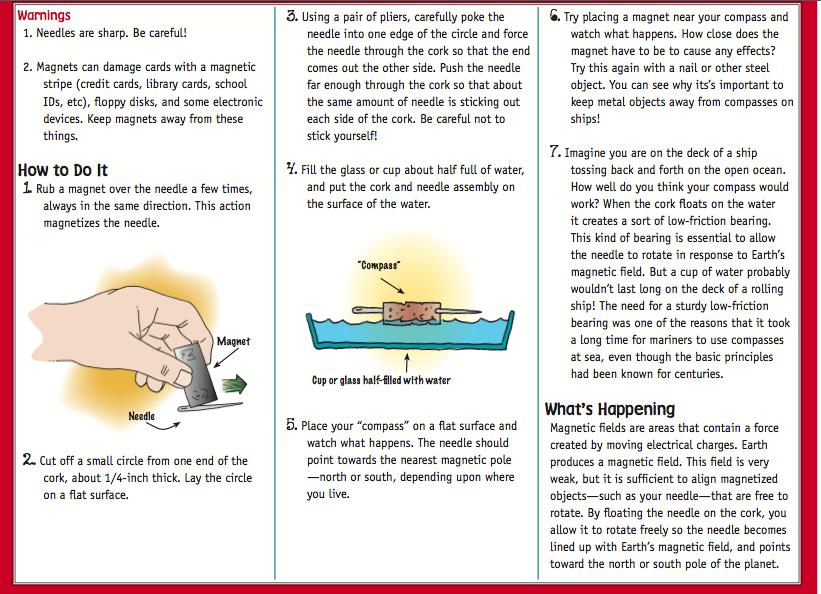
*Not only can magnetism be found within these demonstrations it can also be found in our society. One example of this is a compass! Has anyone every used a compass before?*

**Yeah**

*Does anyone know how compass’ work?*

**No.**

*Well its all about magnetism!!!!! And we are going to make one today using magnets.*



*Well I hope you guys all enjoyed todays lesson and you will look at the world of magnetism a little bit differently now!*